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Odonata registered on a short excursion to Kyshtovka District, Novosibirsk Province, Russia.

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## On the Odonata of North Kazakhstan Province. I. First data on Petropavlovsk

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### Abstract

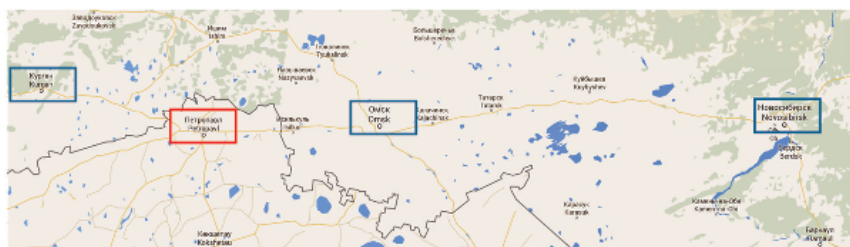
The fauna of Odonata of the environs of Petropavlovsk, North Kazakhstan, was for the first time examined on two short trips in late June and mid August 2015. Thirty five species were revealed. *Coenagrion ecorutum* was recorded in Kazakhstan for the first time, *Gomphus vulgatissimus* the second time and *Stylurus flavipes* the third time. Range expansion of *C. ecorutum* is discussed. Comparison is attempted of the known local Odonata faunas of the environs of Petropavlovsk, Omsk and Novosibirsk cities residing at the same latitude in the West Siberian Lowland. The Petropavlovsk fauna is very close to that of Omsk. The earlier published Kazakh records of *G. vulgatissimus* and *S. flavipes* are clarified and corrected. Breeding of *Aeshna viridis* in Ishim River (lacking water soldier) is supposed.

**Key words:** North Kazakhstan, Russia, West Siberia, West Siberian Plain, *Coenagrion ecorutum*, *Gomphus vulgatissimus*, *Stylurus flavipes*, *Aeshna viridis*, corrected data, Jaccard coefficient values.

### Introduction

The West Siberian and Amazonian Plains are the two largest plains in the world. Because of the vast and perfectly plain relief of the West Siberian Plain, its natural conditions are homogenous and exhibit regular zonality from steppes through forest-steppes, sub-taiga, southern, middle and northern taiga and forest-tundra to tundra. This zonality is latitudinal but the isotherms and zones are slightly slanting to the east, that is, the climate somewhat changes from warmer in the west to colder in the east along each parallel. Of the mentioned zones, the most populated is the forest-steppe, as most favourable for agriculture. The Trans-Siberian Railroad crosses the West Siberian Plain roughly along the middle of the forest-steppe zone along 55° parallel and passes, from west to east, four large cities located at nearly identical latitudes and elevations

and serving as provincial centres: Kurgan (55°25-30' N, 65-90 m a.s.l., 326 thousand people), Petropavlovsk (54°50-55' N, 95-145 m a.s.l., 208 thousand people), Omsk (54°54'-55°05' N, 70-125 m a.s.l., 1 million 173 thousand people), and Novosibirsk (54°50'-55°07'°N, 90-220 m a.s.l., 1 million 567 thousand people)(Figure 1). These cities respectively reside on the banks of the major rivers of Tobol, Ishim, Irtysh and Ob', and are separated by distances of 273, 278 and 610 km. Presently three of these cities, Kurgan, Omsk and Novosibirsk are in Russia while Petropavlovsk is the northernmost city of Kazakhstan. (Recently Petropavlovsk, named after saints Peter and Paul, was officially renamed to Petropavl but the original Russian name is still in the predominant use even locally.) It would be very interesting to compare data on local fauna and flora of the immediate environs of these four cities to observe an effect of longitude. Unfortunately, they are too unevenly explored.



**Figure 1: Cities involved in this study or discussion: Blue frame: Kurgan, Omsk, Novosibirsk (Russia); red frame Petropavlovsk (Kazakhstan)**

Novosibirsk is the largest of these four cities and is the headquarters of the Siberian Branch of the Russian Academy of Science including the Institute of Systematics and Ecology of Animals (formerly Biological Institute), hence the insect fauna of Novosibirsk and its environs is well studied. Fewer data and publication concern Omsk while Kurgan and Petropavlovsk remain very scarcely explored. Odonata of Novosibirsk Province have been being studied by odonatologists Anatoliy Haritonov, Olga Popova, Sergey Borisov, Galina Sukhacheva, Valentin Zaika and me. Data on the city of Novosibirsk and its immediate environs can be found in Kosterin et al. (2001) and Kosterin (2007a; 2013). In Omsk Province, there are data concerning only the city of Omsk, both old (Klapalek 1901; Lavroff 1927; Wnukowsky 1928; Valle 1932) and recent, obtained by me (Kosterin 1996; 2007b) as Omsk is the city where I was born and lived until the age of sixteen and which I repeatedly visited later. I failed to find any published data concerning Odonata of Kurgan or Petropavlovsk.

The same concerns butterflies. Being involved in preparation of a book on the butterflies of Kazakhstan, I found it regrettable that the northernmost province of the country remained a white spot with respect to butterflies and at last planned a trip on 26-28.06.2015 aimed to register at least the most common butterfly species. On this trip I rather unexpectedly found interesting Odonata and so got motivated for another short trip on 15-16.08.2015 to assess also the late summer Odonata aspect. The results of both trips are presented below.



The aim of the trips made it possible to confine the research area to the territory and immediate environs of the city of Petropavlovsk which offer quite a variety of habitats representative to the area in general, including such riparian ones as the Ishim river with its valley and floodplain, a freshwater Lake Bol'shoe Beloe, a slightly brackish Lake Pestroe, and many minor roadside and valley ponds and pools.

## Methods

Odonata were sought and captured by hand net while walking. Individuals were identified by sight or in hand but voucher specimens were collected of all species. Some were photographed in natural conditions by the cameras Olympus Camedia C8989 and Canon EOS 350D with the lens Sigma Zoom 24-78 mm. Coordinates were recorded by Garmin eTrex H personal GPS navigator but the ranges of the actually examined areas and elevations were revised using GoogleEarth.

## The area

Petropavlovsk is situated amidst the forest-steppe zone of the West Siberian floodplain, where the groves are formed almost exclusively by birch (*Betula alba* L. s.l.), locally with participation of aspen (*Populus tremula* L.). The part of this zone between Ural and the Irtysh River is known as 'Ishim Forest-Steppe', situated in the southern western part of the West Siberian Plain, known as the Ishim Plain, at the elevation of 95-145 m a.s.l. The climate in this area is sharply continental, with the average annual temperature +2.2°C, that of July +24.8°C; that of January -18.6°C; sunny weather predominates; annual precipitation as small as 345 mm with the maximum in July (61 mm) and the minimum in March (14 mm); permanent snow cover for ca 5 month, 40-50 cm deep. The flow of the Ishim River is regulated by two water reserves and 11 dams. One of the dams is in the northern part of Petropavlovsk; it does not form a water reserve but just rises the river level and slows its current.

## Localities examined

**Loc. 1.** Petropavlovsk northern part, the Ishim River (Fig. 2) right bank between the Victory Park and the dam which slows the river at this place: high, with a barren clay bluff and short-grass steppe and adventive ash grove above; at some bank section, below the cliff there is a curious outcrop of a white clay looking like ruins of a wall (Fig. 2, top). 54°54-55' N, 69°07' E. 26-28 vi, 15-16 viii 2015.

**Loc. 1a.** The river bank, grassy, with ground water seepages; water margin with a narrow and interrupted stripe of reed (*Phragmites australis* (Cav.) Trin. ex Steud.), with some *Typha angustifolia* L. along water margins; hydrophytes not abundant, represented by *Potamogeton lucens* L. et *praelongus* Wulf., *Nymphoides peltata* (S.G. Gmel.) O.Kuntze, *Elodea canadensis* Michx. Also a deep grassy ravine was examined. 54°53'39-54°40' N, 69°07'40-52' E, 98-202 m a.s.l.



**Figure 2. The Ishim River in the northern part of the city of Petropavlovsk (Loc. 1a). 26.06.2015.**



**Figure 3. A pool in a fold of the Ishim Right bank (Loc. 1b). 28.06.2015.**



**Figure 4. A small roadside swamp in the Petropavlovsk north-eastern environs (Loc. 4). 27.06.2015.**





**Figure 5. A warm-water channel from the power station to Lake Bol'shoe Beloe (Loc. 5a). 27.06.2015.**



**Figure 6. The south-eastern bank of Lake Bol'shoe Beloe (Loc. 6). 27.06.2015.**



**Figure 7. The eastern bank of the Kamenka oxbow lake of the Ishim floodplain (Loc. 7). 28.06.2015 (below) and 16.08.2015 (above).**

**Loc. 1b.** A small stagnant pool in a fold of the right bank (Fig. 3), with willow bushes, *Typha angustifolia*, sedge (*Carex* sp.), some *Alisma plantago-aquatica* L. at banks and filamentous algae in water. 54°54'16"-18" N, 69°07'40"-52' E, 110 m a.s.l.

**Loc. 1c.** Fringe habitats of meadows and bushes and glades of a large grove of adventive *Ulmus laevis* Pall. et *pumila* L. s.l. on the high bank. 54°53'54"-54'13" N, 69°07'54"-08'02" E, 119-124 m a.s.l.

**Loc. 2.** Petropavlovsk northern part, floodland pools and bays at the Ishim River left bank just upstream the dam: very shallow, with a reed strip, shallowest places with *A. plantago-aquatica*, water with scarce *E. canadensis*, some *N. peltata*. 54°54'39"-45" N, 69°07'17"-25' E, 92 m a.s.l. 26 vi 2015.

**Loc. 3.** Petropavlovsk northern environs, Meshchanskiy Forest: a birch forest with fringe habitats of meadows and cuttings, with some planted pine groves and an old cutting area overgrown with bushes and tall meadow. 54°55'-56' N, 69°11'-12' E, 137-140 m a.s.l. 27 vi 2015.

**Loc. 4.** Petropavlovsk north-eastern environs, a small roadside swamp (Fig. 4): shallow, with reed, *T. angustifolia*, sedges (*Carex* sp.), 54°54'50"-53" N, 69°11'11"-19" E, 132 m a.s.l. 27 vi, 15 viii 2015.

**Loc. 5.** Petropavlovsk north-eastern environs, channels connecting the power station and Lake Bol'shoe Beloe, 54°54' N, 69°13'-14' E. 27 vi, 15 viii 2015.

**Loc. 5a.** A warm-water channel from the power station to the lake (Fig. 5): current fast, banks grassy with a narrow strip of sedge, 54°54'28" N, 69°12'58"-13'15" E, 131 m a.s.l.

**Loc. 5b.** A cold-water channel from the lake to the power station: current moderately fast, banks grassy with sedge and reed patches, 54°54'22"-24" N, 69°13'52"-14'07" E, 131 m a.s.l. Odonata at warm channel could have dispersed from the nearby cold one.

**Loc. 6.** Petropavlovsk north-eastern environs, Lake Bol'shoe Beloe SE bank (Fig. 6): with rather a high terrace, meadow fringes with small birch groves, banks flat with a very broad strip of reed, just one access to open water, 54°54'45" N, 69°14'50"-15'25" E, 128-134 m a.s.l. 27 vi, 15 viii 2015.

**Loc. 7.** Petropavlovsk south-western margin, E bank of Kamenka oxbow lake (Fig. 7): a vast reed swamp with a small area of shallow water at a road embankment, with a reed strip and grassy bank with few poplars; water full of *Lemna trisulca* L., also present *L. minor* L., *Ceratophyllum demersum* L., and filamentous algae. 54°51'24"-39" N, 69°06'19"-27" E, 92 m a.s.l. 28 vi, 16 viii 2015.

**Loc. 8.** Petropavlovsk south-western suburbs, Ishim River right flood-plain, flat, clad with a stand of adventive trees (*U. laevis*, *Fraxinus excelsior* L., *Acer negundo* L., *Po-*



*pulus balsamifera* L.); immediate river banks several meters high, grassy. 54°52'02-24" N, 69°06'24-39" E, 90-92 m a.s.l. 28 vi 2015.

**Loc. 9.** Petropavlovsk south-western margin, Lake Pestroe SW bank (Fig. 8): water perhaps slightly brackish, banks narrow to broad zone of reed, water free of hydrophytes but some filamentous algae; behind reed there are fine grassy meadows, some shallow marshes with *Juncus* sp. and *Carex* sp. (Fig. 8) and a small saline area with *Salicornia europaea* L. and *Triglochin maritimum* L., 54°50'19-35" N, 69°05'56-06'41" E, 28 vi, 16 viii 2015.

## Results

The checklist of Odonata species recorded at Petropavlovsk is presented in Table 1, the details below. Subspecies are included if unambiguous. Most probable but still uncertain sightings are given in parenthesis.

### *Calopteryx splendens* (Harris, 1782)

Loc. 1a: 26-28.06.2015 – several ♂♂, ♀♀ seen; 15.08.2015 – 1 ♂ collected; Loc. 8: 28.06.2015 – several ♂♂ seen, 1 ♂ collected.

Expected in such a medium-sized river as Ishim.

### *Lestes dryas* Kirby, 1890

Loc. 1b: 26-28.06.2015 – several mature ♂♂ seen, 2 ♂♂, 1 ♀ collected 26.06.2015; Loc. 4: 27.06.2015 – several mature ♂♂ seen, 1 ♂ collected; Loc. 9 (small sedgy marshes at the lake bank): 16.08.2015 – several ♂♂ and tandems seen, 1 ♂ collected.

Found only at small pools and swamps. At large Lake Pestroe was rather abundant at sedgy marshes (Fig. 9) but absent from reeds of the main lake bank (Fig. 8).

### *Lestes sponsa* (Hansemann, 1823)

Loc. 1b: 15-16.08.2015 – many mature ♂♂ seen, 2 ♂♂ collected 16.08.2015; Loc. 2: 26.06.2015 – many ♂♂ and tandems seen, 2 ♂♂ collected; Loc. 4: 27.06.2015 – very many teneral ♂♂, ♀♀ seen, 3 teneral ♂♂ collected; 15.08.2015 – several ind. seen 2 ♂♂ collected; Loc. 7: 28.06.2015 – 1 teneral ♀ collected; Loc. 9: 28.06.2015 – 1 ♂ checked and released.

Common at grassy banks of pools and swamps but for some reason not at large lakes as Bol'shoe Beloe or Pestroe (the only male found at the latter). Obviously emerges later than the previous species, as many tenerals of *L. sponsa* were observed in late June while all *L. dryas* were mature. Also in late June, *L. sponsa* was still absent from Loc. 1b where only mature *L. dryas* were seen.

### *Lestes virens* Charpentier, 1825

Loc. 4: 27.06.2015 – many ♂♂, ♀♀ seen, including tenerals, 2 ♂♂ collected;



Figure 8. The south-western bank of Lake Pestroe at the Petropavlovsk southern suburbs (Loc. 9). 28.06.2015 (right) and 16.08.2015 (left).



Figure 9. A small marsh with *Juncus* sp. and *Carex* sp. at the south-western bank of Lake Pestroe at the Petropavlovsk southern suburbs (Loc. 9), a habitat of *Lestes dryas* and *Sympetrum pedemontanum*. 16.08.2015 (left).





Figure 10. Four different males of *Coenagrion pulchellum sibiricum* at the eastern bank of the Kamenka oxbow lake of the Ishim floodplain (Loc. 7). 28.06.2015 (left).

15.08.2015 – several ind. seen 2 ♂♂ collected.

Found in abundance, both in June and August, but only at the small swamp of Loc. 4 (Fig. 3).

*Lestes barbarus* (Fabricius, 1798)

Loc. 1b: 26-28.06.2015 – very many teneral ♂♂, ♀♀ seen, 1 ♂, 1 ♀ collected 26.06.2015; 15-16.08.2015 – many mature ♂♂, ♀♀ seen, 2 ♂♂, 2 ♀♀ collected 16.08.2015;

As with the previous species, found in abundance in June and August at only one small swamp, but at the different one (Loc. 1b; Fig. 3), without reed, in a fold of the Ishim valley. The data are, however, too scarce to suppose mutual exclusion of *L. virens* and *L. barbarus*.

*Sympecma paedisca* (Brauer, 1877)

Loc. 1c: 15-16.08.2015 – many ind. seen, 1 ♂, 1 ♀ collected 15.08.2015.

Common in south Siberia and North Kazakhstan; the mid-August specimens were immature as lacking grey pruinescence.

*Coenagrion armatum* (Charpentier, 1840)

Loc. 4: 27.06.2015 – 2 ♀♀ collected.

Common in south Siberia and North Kazakhstan.

*Coenagrion lunulatum* (Charpentier, 1840)

Loc. 1b: 28.06.2015 – 1 ♂ collected; Loc. 7: 28.06.2015, 1 ♂ collected.

Common in south Siberia and North Kazakhstan.

*Coenagrion puella* (Linnaeus, 1758)

Loc. 1a: 26-28.06.2015 – several ♂♂ seen, 1 ♂ collected 26.06.2015; Loc. 1b: 26-28.06.2015 – many ♂♂, several ♀♀ seen; Loc. 2: 26.06.2015 – many ♂♂ seen; Loc. 3: 27.06.2015 – 1 ♂ seen; Loc. 5a: 27.06.2015 – several ♂♂ seen; Loc. 5b – 27.06.2015, several ♂♂ seen. Loc. 7: 28.06.2015 – many ♂♂, some tandems seen, a tandem photographed.

The most common and widespread among the local bluets.

*Coenagrion pulchellum sibiricum* Belyshev, 1973 (Fig. 10)

Loc. 4: 27.06.2015 – 1 ♂, 1 ♀ collected; Loc. 7: 28.06.2015 – very many ♂♂, ♀♀ and tandems seen, 3 ♂♂, 1 ♀ collected, several ♂♂ photographed (Fig. 10); Loc. 9: 28.06.2015 – 1 ♂ seen.

This species inhabits banks with dense grass of rather small stagnant water bodies, such as the Kamenka oxbow (Loc. 7; Fig. 7) where it predominates substantially over *C. puella*.

The specimens are similar to those from Novosibirsk, Omsk and their characters correspond to *C. pulchellum sibiricum* Belyshev, 1964, described from Novopokrovskoe [Novopokrovka] village (the Anuy River lowest reaches in Bystryy Istok District of Altaiskiy Kray Province; 52°13'5" N, 84°26" E); antehumeral stripes

absent (Fig. 10, except for top) or reduced to at most two pairs of small blue spots at anterior and posterior ends of humeral suture (Fig. 10 top); in males, black mark on S2 V-shaped, dorsal black on SIII-SV occupies most of the tergite length and ends anteriorly with three teeth, the central largest (Belyshev 1964; 1973). All females, as at Novosibirsk and Omsk, have S8 entirely blue, as in males. The specimens from the vast region of steppes and forest-steppes of the southern West Siberia are quite homogeneous with respect to the above mentioned characters hence fitting well the subspecies concept. However, the range of the subspecies should be clarified involving many large regional samples. At least Belyshev (1973) pointed out that specimens from Tomsk, situated already in the taiga zone, are similar to the more western subspecies *C. p. interruptum* (Charpentier, 1825).

*Coenagrion ecornutum* (Selys, 1872)

Loc. 1a: 26.06.2015 – 1 ♂ collected; Loc. 1b: 26.06.2015 – 2 ♂♂, 2 ♀♀ collected.

The male found at the Ishim bank most probably had dispersed from the nearby pool of Loc. 1b (Fig. 3) or some other small stagnant water body.

*Erythromma najas najas* (Hansemann, 1832)

Loc. 2: 26.06.2015 – 1 mature ♂ collected; 1 teneral ♂ seen; Loc. 9: 28.06.2015 – few mature, very many teneral ♂♂, ♀♀ seen, 2 ♂♂ collected.

Elsewhere this species prefers open water with floating vegetation; here it was found in two sites with open water but almost without floating vegetation, so that males perched on emergent grasses rather than floating leaves. The great abundance of this species at a slightly brackish Lake Pestroe (the second most abundant damselfly) (Fig. 8) was surprising.

*Enallagma cyathigerum risi* Schmidt, 1961

Loc. 6: 27.06.2015 – 1 ♀ collected; Loc. 7: 16.08.2015 – 2 ♂♂ collected, one more seen; Loc. 9: 28.06.2015 – very many ♂♂, ♀♀ seen including tenerals and tandems, 2 ♂♂ collected; 16.08.2015 – only 1 ♂ seen.

This subspecies is pertained to forest-steppe and steppe zones of Asia and the easternmost Europe and is capable of developing in brackish water, sometimes enormously abundant (Kosterin 2004; Kosterin & Zaika 2010) but well inhabits also fresh water (Kosterin et al., 2001; 2005; Bernard & Kosterin 2010). It is noteworthy, however, that at Petropavlovsk in late June, this species was found in great abundance at a slightly brackish Lake Pestroe (Fig. 8) and beyond it only a single female was collected at the large but fresh Lake Beloe. In mid-August the males were found also at a small and heavily vegetated, obviously fresh-water oxbow lake of Kamenka (absent in late June), where they could have dispersed from the nearby Lake Pestroe.

*Ischnura elegans* (Vander Linden, 1820)

Loc. 1a: 26-28.06.2015 – many ♂♂, ♀♀ seen, 2 ♂♂ collected 26.06.2015; Loc. 2: 26.06.2015 – very many ♂♂, ♀♀ seen, 2 ♂♂, 6 ♀♀ collected; Loc. 5a: 27.06.2015 –

several ♂♂, ♀♀ seen; 15.08.2015 – 1 juv. ♀ collected; Loc. 5b: 27.06.2015 – several ♂♂, ♀♀ seen; 15.08.2015 – 1 ♂ collected; Loc. 6: 27.06.2015 – several ♂♂, ♀♀ seen; Loc. 9: 28.06.2015 – several ♂♂, ♀♀ seen.

Omnipresent, still flying in mid-August.

*Platycnemis pennipes* (Pallas, 1771)

Loc. 1a: 26-28.06.2015 – many ♂♂, ♀♀ seen, 1 ♂ collected 26.06.2015; 15-16.08.2015 – several ♂♂, ♀♀ seen; Loc. 5a: 27.06.2015 – several ind. seen; Loc. 5b: 27.06.2015 – several ind. seen.

More than expectable at a medium-sized river.

*Aeshna juncea* (Linnaeus, 1758)

Loc. 1c: 15.08.2015 – 1 ♂ collected; 16.08.2015 – 1 ♂ collected (by S. Knyazev).

Only two males were collected in mid-August as ranging at edges of an elm grove near the high right bank of the Ishim, that is, on trophical (feeding) dispersal rather than at a breeding place. It was strange not to observe them at water, since at that time the nearby Ishim was free of males of the larger competitive *Aeshna* species which expel males of *A. juncea* (Bernard & Kosterin 2010). Elsewhere it was autumn when I used to often observe males of *A. juncea* at water.

*Aeshna crenata* (Hagen, 1856)

Loc. 1a: (♀ 26-28.06.2015 – several ♂♂ seen); 28.06.2015 – 1 ♀ seen.

In late June I repeatedly observed large males of either *A. crenata* or *A. serrata* ranging over the water along the Ishim River banks. They were few in number and so did not hold territories and did not readily return to the same place. The dull bluish rather than clear yellowish stripes of synthorax suggested rather *A. crenata* than *serrata*. The only female which I observed there had strongly darkened wings, that is a diagnostic character of *A. crenata*. Unfortunately, not a single specimen was available to prove the identification in hand. However, it was a female of *A. serrata* which was collected at Ishim in August, namely at a margin of the nearby elm grove. At the same time, in August I observed no breeding *Aeshna*, that was strange since *A. crenata* breeds at ponds, lakes and slow rivers, so Ishim fitted to its habitat requirements. *A. serrata* tends to inhabit open landscapes such as steppes or forest-steppes while *A. crenata* tends more to forests, however these trends are only quantitative and not strong, so that both species co-occur almost everywhere in West Siberia (Kosterin 1996; 2004; 2007a; Kosterin et al., 2010; Kosterin & Zaika 2010) and were expectable at Petropavlovsk (note that the high right bank of Ishim is a steppe habitat while there is a large poplar forest along its left bank, so that the landscape types preferred by both species meet at the Ishim).

*Aeshna serrata* (Hagen, 1856)

Loc. 1a: 15.08.2015 – 1 ♀ collected; (♀ Loc. 3: 27.06.2015, 2 ♂♂ seen); Loc. 5b: 15.08.2015 – 1 ♂ seen, 1 ♀ collected.

The steppe surroundings of the large flat Lake Bol'shoe Beloe including the channels, as well as Lake Pestroe, looked a typical habitat of *A. serrata* in West Siberia and North Kazakhstan. So I was surprised to see too few of them: two specimens at the former and only one uncertain sighting of a large *Aeshna* at the latter on 16.08.2015. However I missed the best time for *Aeshna*, July.

Both collected females belonged to the morph with the greenish-yellow body pattern while the androchromatic blue morph is common in West Siberia and North Kazakhstan as well.

*Aeshna grandis* (Linnaeus, 1758)

Loc. 1c: 26.06.2015 – 1 ind. seen; 16.08.2015 – several ind. seen; Loc. 4: 15.08.2015 – 1 ind. seen; Loc. 7: 28.06.2015 – 1 ind. seen; Loc. 8: 28.06.2015 – 1 ind. seen.

Seen at different habitats although nowhere abundant; unmistakable, common.

*Aeshna viridis* Eversmann, 1836

Loc. 1a: 26.06.2015 – 1 ♂ collected, 2 ♂♂ released, several ♀♀ seen; 28.06.2015 – 1 ♂ seen; Loc. 1c: 16.08.2-15 – 1 ♀ collected.

In late June, individuals of both sexes were repeatedly startled from dense grass at the Ishim right bank near the water. Of the two males examined in hands, one was immature, with the abdominal ground colour still rather green than blue. Most probably Ishim serves the breeding habitat of this species, see the 'Discussion' section.

*Aeshna affinis* (Vander Linden, 1823)

Loc. 7: 28.06.2015 – 1 ♂ seen; the city centre, Mira street, 54°53'04" N, 69°08'43" E, 28.06.2015 – 1 ♀ collected.

The immature, still fulvous female found at 5:30 p.m. in the city centre ranged over a very small area above (2-3 m high) a flower clump in front of a block of flats; this behaviour is common for this species on dispersal. The male at Lake Kamenka analogously ranged at 3-4 m above a small area of reed thicket at midday, which could equally be a breeding behaviour.

*Aeshna mixta* (Latreille, 1805)

Loc. 1c: 15-16.08.2015 – 2 ♂♂ seen, 1 ♀ collected 16.08.2015; (?Loc. 6: 15.08.2015 – 1 ind. seen); (?Loc. 9: 16.08.2015 – 1 ind. seen).

This species is among those with the latest flight season. At Loc. 1c, the two males flew 6-7 m high above a large glade in the elm/maple stand, permanently attacking each other; the female was captured in herbs at a grove margin.

*Anax parthenope* Selys, 1839

Loc. 1a: 26.06.2015 – 1 ♂ seen.

The male which flew above the Ishim bank well exhibited a conspicuous bright-blue S2 and dull brown synthorax, characteristic for the species.





Figure 11. *Ophiogomphus cecilia* is well camouflaged at any background: females at the Ishim River right bank (Loc. 1a, 28.06.2015 and Loc. 1c, 26.06.2015, respectively).



Figure 12. A male of *Orthetrum cancellatum* at Lake Pestroe SW bank (Loc. 9), 16.08.2015.



Figure 13. A female of *Symptetrum pedomontanum* at a small sedgy marsh (Fig. 9) at Lake Pestroe SW bank (Loc. 9), 16.08.2015.

*Gomphus vulgatissimus* (Linnaeus, 1758)

Loc. 1a: 26.06.2015 – 1 ♂ collected.

The mature, grey-and-black male landed to moist clay at the foot of the right bank bluff of Ishim.

*Stylurus flavipes* (Charpentier, 1825)

(?Loc. 1a: 26.06.2015 – 1 ♂ seen); Loc. 3, the northern road off the city along the forest margin, 54°54'45" N, 69°09'50" E – 1 ♂ bumped by traffic collected.

The sighting at the Ishim bank was provisionally attributed to this species because of an evenly lemon-yellow ground colour, while the bumped male found just in 2.3 km E of Ishim confirmed its presence at that river.

*Ophiogomphus cecilia* (Fourcroy, 1785) (Fig. 11)

Loc. 1a: 26.06.2015 – 1 ♂ collected; 28.06.2015 – 1 ♂ photographed (Fig. 11 top);

Loc. 1c: 26.06.2015 – 1 ♀ photographed (Fig. 11, bottom).

Found both at the breeding place at Ishim (males, Fig. 11, top) and nearby on dispersal (the female, Fig. 11, bottom).

*Cordulia aenea* (Linnaeus, 1758)

Loc. 1c: 26.06.2015 – 1 ♂♂ collected.

This boreal species prefers woody and especially peaty habitats; therefore it was surprising to find a male in the forest-steppe Petropavlovsk. This male was found ranging over a pool at a muddy road crossing the stand of adventive elm and maple. This was curiously similar to the same unexpected finding of this species in Omsk on 10.07.2007: also a male ranging along adventive ash-leaved maple grove near the river of Irtysh, plus a female resting (Kosterin 2007b).

*Somatochlora metallica* (Vander Linden, 1825)

(?Loc. 1a: 26-28.06.2015 – several ♂♂ seen;) Loc. 5b: 27.06.2015 – 1 ♂ collected.

Behaviour and appearance of few males ranging very low and slowly along the emergent grass at the Ishim water margin suggested *S. metallica*. Presence of this species is confirmed by a male from another locality, the cold channel from Lake Beloe to the power station.

*Somatochlora flavomaculata* (Vander Linden, 1825)

(?Loc. 1c: 26.06.2015 – 1 ♀ seen); Shukhova street in the city 54°54'08" N, 69°08'59" E, 26.06.2015 – 1 dead ♀ bumped by traffic collected.

A female observed as ranging high above a clearing in the elm/maple grove at Ishim had strongly darkened wings, as in most females of *S. flavomaculata* in West Siberia (Belyshev 1973; Bernard & Kosterin 2010; Kosterin et al. 2013). Presence of this species was confirmed by the finding of a dead, also dark-winged female downtown.

*Libellula quadrimaculata* Linnaeus, 1758

Loc. 1a: 26-28.06.2015 – several ind. seen; Loc. 1b: 26-28.06.2015 – several ind.



seen; Loc. 3: 27.06.2015 – several ind. seen; Loc. 4: 27.06.2015 – several ind. seen; Loc. 5b: 27.06.2015 – several ind. seen; Loc. 6: 27.06.2015 – many ind. seen; Loc. 7: 28.06.2015 – many ind. seen.

Common everywhere but not abundant.

*Orthetrum cancellatum* (Linnaeus, 1758) (Fig. 12)

Loc. 1a: 26-28.06.2015 – many mature ♂♂ seen; Loc. 1c: 26-28.06.2015 – many teneral ♂♂, ♀♀ seen, 1 ♂, 1 ♀ collected 26.06.2015; Loc. 5a: 27.06.2015 – several ♂♂ seen; Loc. 5b: 27.06.2015 – several ♂♂ seen; Loc. 6: 27.06.2015 – many mature ♂♂ seen; Loc. 8: 28.06.2015 – several ♂♂ seen; Loc. 9: 16.08.2015 – 1 ♂ photographed (Fig. 12).

Tends to open banks; common at Ishim and Lake Bol'soe Beloe but not found at lake Pestroe in late June; oppositely, in August the only male was found at the latter.

*Leucorrhinia pectoralis* (Charpentier, 1825)

Loc. 3: 27.06.2015 – many ♂♂, ♀♀ seen, 1 ♂, 1 collected; (♀ Loc. 8: 28.06.2015 – ? 1 ♀ seen).

Found only at glades in the birch forest, surely on dispersal (plus an uncertain sighting in the Ishim flood plain)

*Sympetrum flaveolum* Linnaeus, 1758)

Numerous to extremely numerous in Loc. 1, Loc. 3, Loc. 4, Loc. 7, Loc. 9 but few at Loc. 2, Loc. 5a, Loc. 5b, and Loc. 6; scarce on 27.06.2015 but extremely numerous on 15.08.2015; very many tenerals at Loc. 4 on 27.06.2015, many tenerals at Loc. 9 and some tenerals at Loc. 7 on 28.06.2015. 1 ♂, 3 ♀♀ collected in Loc. 1c on 26.06.2015; 1 ♀ on 16.08.2015.

These dragonflies were astonishingly numerous, equally in late June and mid-August (when most males gain in red colour); however, even in August tandems were seldom seen.

I made no counts but it seems that not less than half of females were represented by the morph 'hyalinata' Rodz., with amber confined to the wing very bases not even reaching the triangles. This form attains modest frequencies at Omsk or Novosibirsk.

*Sympetrum pedemontanum* (Müller in Allioni, 1766) (Fig. 13)

Loc. 9: 16.08.2015 – 2 ♀♀ collected, 1 ♀ photographed (Fig. 13).

Found only at small segdy shallow marshes, almost without open water, near a bank of the major Lake Pestroe (Fig. 9), where it occurred together with *L. sponsa*.

*Sympetrum danae* (Sulzer, 1776)

Loc. 1c: 15-16.08.2015 – many ♂♂, ♀♀ seen (still very inferior in number to *S. flaveolum*); Loc. 4: 15.08.2015 – 1 ♀ collected; Loc. 6: 15.08.2015 – several ♂♂, ♀♀ seen, 1 ♀ collected; Loc. 7: 16.08.2015 – several ind. seen; Loc. 9: 16.08.2015 – several ind. seen.

The common species with a prolonged and late flight period.

*Sympetrum vulgatum vulgatum* (Linnaeus, 1758)

Loc. 1c: 15-16.08.2015 – many ♂♂, several ♀♀ seen (still very inferior in number to *S. flaveolum*), 3 ♂♂ collected on 16.08.2015; Loc. 3: 27.06.2015 – 1 teneral ♀ collected; Loc. 6: 15.08.2015 – several ind. seen, 2 ♂♂, 1 ♀ collected; Loc. 9: 16.08.2015 – several ♂♂ seen.

Large shallow steppe lakes in southern West Siberia and North Kazakhstan are known as supporting tremendous populations of this species. Its moderate abundance at Petropavlovsk was quite surprising. In late June I managed to spot only one teneral female, among uncountable *S. flaveolum*, amidst an old forest cutting overgrown with herbs and bushes. Everywhere in August, mature individuals were well noticeable among *S. flaveolum* because of clear wings, a colder tint of red in males, and a slightly larger size.

## Discussion

### Important findings

Belyshev (1973) considered *C. ecornutum* to range in the Far East and South Siberia to about 54° to the North and to the foothills of the Altai Mts. in the west, namely to Altaiskiy Kray Province of Russia. In the latter province, there was a record from Loktevka village near the border of Kazakhstan; for this reason Belyshev & Shevchenko (1971) reported *C. ecornutum* for Kazakhstan but it was an extrapolation only (Chaplina et al. 2007). Hence, finding of *C. ecornutum* in Petropavlovsk is the first actual record of this species in Kazakhstan, and made in quite an unexpected place in the central north rather than in the north-east of the country.

It should be noted however that during the last decades, quite a number of surprising records of *C. ecornutum* were already made northerly and westerly of the above mentioned presumed limits of this species, most probably indicating at a rapid expansion of the species (Popova & Haritonov 2012):

- in 1989 at Magan near Yakutsk, 62°06' N (!) (Fukui 1992);
- in 1996 in Bashkortostan in South Ural (Yanybaeva et al. 2006); later recorded at 32 localities in Bashkortostan and Chelyabinsk Province (Haritonov & Eremina 2010);
- in 2008 in Novosibirsk Province, where now is known from four localities in the north-west, centre and east (two localities) of the province (Popova & Haritonov 2012; Kosterin in prep.).

The Petropavlovsk record of *C. ecornutum* is about equidistant (550-570 km) from its earlier records in Chelyabinsk Province (a number of records) and Novosibirsk Province (Lake Fadikha) (Popova & Haritonov 2012), hence filling the large gap between Ural and the eastern West Siberian Lowland in the known distribution of the species. Curiously, two weeks later I made a somewhat closer (500 km NEE) and more northern record at Kyshtovka village, NW Novosibirsk Province (Kosterin in prep.).

There was only one record of *G. vulgatissimus* in Kazakhstan. Chaplina et al. (2007: 356) published it as follows: "4. 3 ♂, 4 ♀, VI 1983; VII 1989 (Kosterin, Haritonov)"; locality 4 was explained as "Ishim River, 53°30' N 66°38' E, 170 m" (Ibid.: 351). One can see that these coordinates do not point at the Ishim River. In 2004, I provided Irina Chaplina with the following my unpublished records: "1 ♀, Ishim, 3-VII [1983]; 1 ♀, Ishim, 10-VII [1983]", where 'Ishim' was explained as follows: "the Ishim River 3 km upstream of Nezhinka village". This locality had the following coordinates: 53°03' N 66°44' E, 158 m a.s.l. The base of our expedition in 1983 was situated at a field station of Ruzaevskiy State Farm with coordinates 53°05' N 66°38' E, 188 m a.s.l. Most probably, it was adopted for all data taken on this expedition, and an error was made in the longitude minutes. The other mentioned specimens, 3 ♂♂ and 2 ♀♀, most probably were collected by A.Y. Haritonov, either in June 1983 at one of the two above mentioned sites, or in July 1989 elsewhere at Ishim River, or at the point 53°30' N 66°38' E, not at the river. However, the latter option is hardly possible since both 1983 and 1989 data were referred to as the same locality, an error in coordinates being much more probable than merging two localities differing in 27 minutes of latitude. I have no information about Haritonov's trips in 1989 other than the fact that GPS navigators still were not in use. Generally, that paper by Chaplina et al. (2007) is misleading and so harmful because of overall confusion of locality numbers, with those in the species checklist not corresponding to those in the list of explanation because of the unknown shift (Kosterin & Gorbunov 2010; Borisov & Kosterin 2014). But the here discussed locality 4 is not shifted, although corrupted otherwise.

Anyway, *G. vulgatissimus* so far was recorded in Kazakhstan only at the Ishim River at 53°03' N and now is recorded at the same river 263 km north-easterly, at 54°54' N.

The only two so far known records of the true *S. flavipes* in Kazakhstan, from Pavlodar city and Temirtau town, were published by Borisov & Kosterin (2014), while earlier records referred in fact to *Stylurus ubadschii* (Schmidt, 1953), as was clarified in the same paper (Borisov & Kosterin 2014). Note that this paper exists in two pdf versions. The initial published version contained an error introduced by the copy editor: the Kazakh 'materials' (specimens, localities, dates, collectors and collections) on *S. ubadschii*, listed and discussed in Remarks to *S. flavipes*, was moved from 'Remarks' to the 'Material' of *S. flavipes*, so that the text remained correct but the provided data misleading. When this was found, the initial pdf was replaced by the corrected one at the journal site (<http://eco.nsc.ru/entomolog.html>) and at the Russian Scientific Electronic Library (<http://elibrary.ru>).

### Earlier data from Petropavlovsk

No such data seem to have been published. It is noteworthy that there are no dots at Petropavlovsk (and Kurgan) on the maps in Belyshev (1973). In the notorious paper by Chaplina et al (2007) pretending to be summarising for Kazakhstan (but see above), Petropavlovsk is present in the list of localities under the number 1, that could inspire a hope that this locality was unaffected by the numeration shift. However,

locality 1 is not at all mentioned in their species checklist. This means that either the respective information was corrupted as well, or that species recorded from Petropavlovsk are hidden among those claimed widespread across Kazakhstan (17 species), across Kazakhstan except for the south (1 species) or common in North Kazakhstan (4 species), for which the complete list of localities were not presented.

### Comparison of the local faunas of the three cities at 55° parallel in the West Siberian Lowland

Table 1 shows the presently revealed members of the Odonata local faunas of the immediate environs of Petropavlovsk (this paper), Omsk (Kosterin 1996; 2007b) and Novosibirsk (Kosterin et al. 2001; Kosterin 2007a; 2013). The data on Academy Town, situated ca 30 km S of Novosibirsk centre, belonging to Novosibirsk administratively and especially thoroughly explored, partly as a place where I live (Kosterin 2007a; 2013), are considered among those of Novosibirsk. For Omsk, four old records were excluded. The record of *Nehalennia speciosa* (Charpentier, 1840) by Klapalek (1901), most probably referred to 'Omsk' only as the administrative centre of a province, that those days was much larger than now, rather than an exact locality. *Sympecma fusca* (Vander Linden, 1823), *Aeshna cyanea* (Müller, 1764) and *Sympetrum fonscolombii* (Selys, 1840) reported by Lavroff (1927) are most probably misidentifications (Wnukowsky 1928). Note that a male of "*Ophiogomphus spinicornis*" reported for Novosibirsk Province (Novososedovo village) by Schorr (2012) was a misidentified *O. cecilia*. *O. spinicornis* Selys, 1878 in fact occurs in Russia only in southern central and south-eastern Siberia as known from southern and central Tuva, southern banks of Lake Baikal and in the Onon River basin in southern Transbaikalia (the Onon River) (Kosterin 2004; 2005; Kosterin & Zaika 2010).

As it could be expected from the same latitude, lack of geographical barriers, general similarity of natural conditions, and not so big a distance (278 km), the local fauna of Petropavlovsk is very similar to that of Omsk. There are the following gaps in Petropavlovsk as compared to Omsk:

- *Lestes macrostigma* Eversmann, 1836: no doubt this species will be found once a proper habitat, some small brackish or freshwater pool, is found.
- *Coenagrion johanssoni* Wallengren, 1894: reported for the Omsk environs by Wnukowsky (1928) by collections by G.Y. Bey-Bienko in 1926 but not found in 1970s–2000s by me (Kosterin 1996; 2007b). This species prefers non-eutrophic pools and ponds with dense emergent vegetation, especially in moorlands, but sporadically inhabits ponds of other types (Bernard & Kosterin 2010). It is rather rare at Novosibirsk (Kosterin et al. 2001; Kosterin 2013) while either extremely rare or vanished at Omsk. Anyway, the environmental conditions of Omsk and especially Petropavlovsk look a bit too dry and open to be preferable for this species.
- *Coenagrion hastulatum* (Charpentier, 1840): a common species at Omsk, Novosibirsk and elsewhere in West Siberia; its absence in even a short survey looks strange.
- *Epitheca bimaculata* (Charpentier, 1825): also reported for Omsk in 1920s by Lavroff (1927) but not found in 1970s–2000s by me (Kosterin 1996; 2007b), perhaps very

rare there. It can be present in Petropavlovsk at some larger Ishim oxbows which were not examined.

- *Leucorrhinia rubicunda*: also a very common West Siberian species, to be found.
- *Sympetrum sanguineum* (Müller, 1764): invariably abundant at Omsk and Novosibirsk, specially sought for in Petropavlovsk. Its absence there was unexplainable; most probably to be found later.

The absences in Omsk as compared to Petropavlovsk are as follows:

- *C. ecornutum*: its finding at Petropavlovsk was quite unexpected. However, the species is obviously expanding its range in Siberia (Popova & Haritonov 2012). So, most probably it has already appeared at Omsk and is to be found by a special search.
- *O. cecilia*: missing of any Gomphidae but the common *S. flavipes* from my repeated surveys in 1970s-2000s in Omsk is strange. *O. cecilia* seems to be omnipresent in the forest-steppe zone of West Siberia (Kosterin 2004). *G. vulgatissimus* was recorded at Omsk in the beginning of the 20th century by Lavroff (1927) but not later, so the correctness of that record was doubted by Wnukowsky (1928), Belyshev (1973) and Kosterin (1996). However, the species could hardly be confused with anything and in view of the recent findings in Petropavlovsk and Novosibirsk, the record by Lavroff (1927) could be correct. The conditions preventing *O. cecilia* and *G. vulgatissimus* from inhabiting the Omsk environs at present remain unknown.

The local fauna of Novosibirsk, which is situated 610 km E of Omsk, that is more than twice as far as Petropavlovsk, contains ten extra species as compared to the united fauna of both above mentioned cities. These are widespread boreal species more or less pertained to peaty habitats: *N. speciosa*, *Somatochlora arctica* (Zetterstedt, 1840), *Leucorrhinia dubia* (Vander Linden, 1825), *L. albifrons* (Burmeister, 1839), Asiatic lotic species *Shaogomphus postocularis epophthalmus* (Selys, 1872), *Nihonogomphus ruptus* (Selys, 1857) and *Macromia amphigena fraenata* Martin, 1906, an oxbow lake species *Leucorrhinia caudalis* (Charpentier, 1840), a pioneering species of newly formed ponds *Ischnura pumilio* and an enigmatic Manchurian species *Sympetrum croceolum* (Selys, 1883), with only three known local populations in West Siberia isolated from the main Far Eastern range and thought to be relics of the climatic optimum of the Holocene (Kosterin 2005). Appearance at Novosibirsk of more boreal species is partly explained by its colder and more continental climate than at Petropavlovsk and Omsk. Partly their appearance has the same reason as that of the Asiatic lotic species: the right bank of the Ob' River, even within the city of Novosibirsk, is already a part of the Altai-Sayan Mountain System rather than West Siberian Plain, although elevations there are still low. As a consequence, there appears some mild hilly relief providing greater diversity of habitats, on one hand including forest bogs and on other hand various brooks and rivulets, while the very shallow relief of the West Siberian Plain is very homogenous and favours numerous open lakes of various salinity and reed swamps but is very poor of flowing water. The much greater efforts of many people invested in thoroughly studying the environs of

Novosibirsk is another factor to which the records of the tiny *N. speciosa* and *I. pumilio* and rare *L. caudalis* may be ascribed.

There are only two extra species recorded in Novosibirsk Province but not in the Novosibirsk environs: *C. ecornutum* (Popova & Haritonov 2012) and *Aeshna subarctica* (Walker, 1908) (Kosterin et al. 2001; Popova & Haritonov 2012). There is little doubt that the former species has already reached Novosibirsk as well, as it was found on the Kanarbuga River 77 km NEE of Novosibirsk and at Lake Maloe 97 km S of Novosibirsk (Popova & Haritonov 2012), and so is just to be found at the city.

Of course the data on Petropavlovsk are still too fragmentary for quantitative biogeographical comparisons. It was, however, too easy to estimate the Jaccard coefficient values – to assess the similarity and diversity of the local faunas – even at this stage, as follows: Petropavlovsk – Omsk: 0.76; Petropavlovsk – Novosibirsk: 0.65; Omsk – Novosibirsk: 0.76; (Petropavlovsk+Omsk) – Novosibirsk: 0.77. Quite expectedly, the least value is at the pair of most distant cities, Petropavlovsk and Novosibirsk, while Omsk situating between them shows the same value in the pairs with both.

**Table 1. Odonata species recorded in the environs of Petropavlovsk (this paper), Omsk (summarised in Kosterin 1996; 2007b) and Novosibirsk (Kosterin et al. 2001; Kosterin 2007a; 2013).**

Species	Petropavlovsk	Omsk.	Novosibirsk
<i>Calopteryx splendens</i>	+	+	+
<i>Lestes dryas</i>	+	+	+
<i>Lestes sponsa</i>	+	+	+
<i>Lestes virens</i>	+	+	+
<i>Lestes barbarus</i>	+	+	+
<i>Lestes macrostigma</i>	-	+	+
<i>Sympecma paedisca</i>	+	+	+
<i>Coenagrion johanssoni</i>	-	+ <sup>3</sup>	+
<i>Coenagrion armatum</i>	+	+	+
<i>Coenagrion lunulatum</i>	+	+	+
<i>Coenagrion hastulatum</i>	-	+	+
<i>Coenagrion puella</i>	+	+	+
<i>Coenagrion pulchellum sibiricum</i>	+	+	+
<i>Coenagrion ecornutum</i>	+	-	-
<i>Erythromma najas najas</i>	+	+	+
<i>Enallagma cyathigerum risi</i>	+	+	+
<i>Ischnura elegans</i>	+	+	+
<i>Ischnura pumilio</i>	-	-	+
<i>Nehalennia speciosa</i>	-	-	+
<i>Platycnemis pennipes</i>	+	+	+
<i>Aeshna juncea</i>	+	+	+
<i>Aeshna crenata</i>	+ <sup>1</sup>	+	+

Species	Petropavlovsk	Omsk.	Novosibirsk
<i>Aeshna serrata</i>	+	+	+
<i>Aeshna grandis</i>	+	+	+
<i>Aeshna viridis</i>	+	+	+
<i>Aeshna affinis</i>	+	+	+
<i>Aeshna mixta</i>	+	+	+
<i>Anax parthenope</i>	+ <sup>1</sup>	+	-
<i>Gomphus vulgatissimus</i>	+	+ <sup>3</sup>	+
<i>Shaogomphus postocularis epophthalmus</i>	-	-	+
<i>Stylurus flavipes</i>	+	+	+
<i>Ophiogomphus cecilia</i>	+	-	+
<i>Nihonogomphus ruptus</i>	-	-	+
<i>Cordulia aenea</i>	+	+	+
<i>Epithea bimaculata</i>	-	+ <sup>3</sup>	+
<i>Somatochlora metallica</i>	+	+	+
<i>Somatochlora flavomaculata</i>	+	+	+
<i>Somatochlora arctica</i>	-	-	+
<i>Macromia amphigena fraenata</i>	-	-	+
<i>Libellula quadrimaculata</i>	+	+	+
<i>Orthetrum cancellatum</i>	+	+	+ <sup>2</sup>
<i>Leucorrhinia dubia</i>	-	-	+
<i>Leucorrhinia rubicunda</i>	-	+	+
<i>Leucorrhinia pectoralis</i>	+	+	+
<i>Leucorrhinia albifrons</i>	-	-	+
<i>Leucorrhinia caudalis</i>	-	-	+
<i>Sympetrum flaveolum</i>	+	+	+
<i>Sympetrum pedemontanum</i>	+	+	+
<i>Sympetrum danae</i>	+	+	+
<i>Sympetrum vulgatum</i>	+	+	+
<i>Sympetrum sanguineum</i>	-	+	+
<i>Sympetrum croceolum</i>	-	-	+ <sup>4</sup>
<b>Total: 52</b>	<b>36</b>	<b>39</b>	<b>50</b>

<sup>1</sup> Singular visual sightings not proved by specimens.

<sup>2</sup> An unpublished record in Novosibirsk: 2 ♂♂ (photos), the park at Gorskaya Street and Communal Bridge at the Ob' right bank floodplain, a lake in an inundated former granite pit, 23.08.2014. O. Kosterin. In Novosibirsk Province, the species was so far recorded only in the south (Karasuk District) and only since 2005 (Borisov et al. 2010); most probably it is just expanding northwards.

<sup>3</sup> Recorded only in 1920s (Lavroff 1927; Wnukowsky 1928) but not in 1970s-2000s (Kosterin 1996; 2007a).

<sup>4</sup> a singular record of three individuals in the same floodplain park mentioned in (2) in 2000 (Kosterin et al. 2001). This species is very conspicuous and can hardly be overlooked. So far only two known isolated populations are known in West Siberia (Kosterin et al. 2001; Kosterin

2005), at Manzherok lake in the foothills Altai Mts. (Kosterin et al., 2001) and at Meret' village in Suzunskiy Bor pine forest in SE Novosibirsk Province (Haritonov 2000; Kosterin et al., 2001). Not found in that place in Novosibirsk later, perhaps it was a temporary colonisation.

### ***Aeshna viridis* at the river of Ishim**

*A. viridis* has the most peculiar biology of our (Siberian and Kazakh) *Aeshna* species, differing from them in two respects:

- (i) The larvae as a rule live among leaves of the water soldier (*Stratiotes aloides* L.), hence breeding is focused to lakes oxbows with water soldier and females oviposit into water soldier plants (Kosterin et al 2001).
- (ii) Feeding activity of the imagines is predominantly crepuscular (Kosterin 2008; Bernard & Kosterin 2010).

Both features are not strict in Siberia and there are counter-examples.

(i) Indeed, there are oxbows with water soldier which support large populations of *A. viridis*, e.g. at Novosibirsk (Kosterin et al. 2001; Kosterin 2007a). In absence of water soldier, the species is, however, capable of breeding in other habitats. For instance, in Tomsk Province we observed oviposition into petioles of *Nuphar pumila* L., also growing in an oxbow lake (Bernard & Kosterin 2010). In other cases when few individuals of *A. viridis* were found in habitats without water soldier, e.g. in the Irtysh River floodplain in Omsk (Kosterin 1996), it cannot be excluded that they had dispersed from elsewhere, some unspotted water soldier habitats.

(ii) Some daytime activity was observed in Tomsk Province at the moments when the sun disappeared behind clouds (Bernard & Kosterin 2010) and in Omsk Province at the day of mass outburst of *Loxostege sticticalis* L. moths (Kosterin 2008) – using them for feeding. Besides, its oviposition was registered in Omsk without special conditions (Kosterin 1996).

At Petropavlovsk I did not find water soldier habitats although they may well exist somewhere at the Ishim floodplain. The question is if the reedy and grassy right bank of the Ishim river was a breeding place of those *A. viridis* individuals which were repeatedly startled from the grass near the water in late June, or they came from elsewhere on dispersal. There were neither water soldier nor *Nuphar* nor any large floating plants; only sedge, cattail, reed, submerged pondweed (*Elodea canadensis* L.) and scarce floatingheart (*Nymphoides peltata*) were present. No teneral individuals of *A. viridis* with glittering wings were seen. However, I captured an immature male with the abdominal ground colour still green rather than blue. No one actively flying individual was seen, even in twilight. This was especially important: since dispersal foraging individuals of this species commence active feeding flight at dusk; so the Ishim banks was hardly their foraging place. Hence I incline to think that those young individuals were found at their breeding place rather than at a foraging place.

It is noteworthy that in July 1983, I repeatedly observed and collected *A. viridis* (rather few) at Nezhinka village, 263 km SW from Petropavlovsk, where water bodies were



represented by very shallow steppe lakes, unfit for this species, and the same Ishim River but in a narrower granite rocky valley without broad flood-plains or large oxbows. No doubt there were no soldier habitats there. Hence I suppose that in North Kazakhstan, some small (with respect to the number of specimens) populations of *A. viridis* inhabit the Ishim River (or its small oxbows) without water soldier.

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## **Odonata registered on a short excursion to Kyshtovka District, Novosibirsk Province, Russia**

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### **Abstract**

During a four-day trip to Kyshtovka District, the most northwestern district of Novosibirsk Province, 21 species of Odonata were recorded. Two significant findings were made: that of *Coenagrion ecornutum* is most northern in West Siberia, and that of *Lestes macrostigma* is perhaps the northernmost in its range. The latter species was found over small, shallow, freshwater pools along a roadside. The diversity of this species' habitats in Siberia in comparison to its uniform habitats at brackish water in Western Europe is discussed.

**Key words:** Russia, West Siberia, West Siberian Plain, Novosibirsk Province, Kyshtovka District, *Coenagrion ecornutum*, *Lestes macrostigma*.

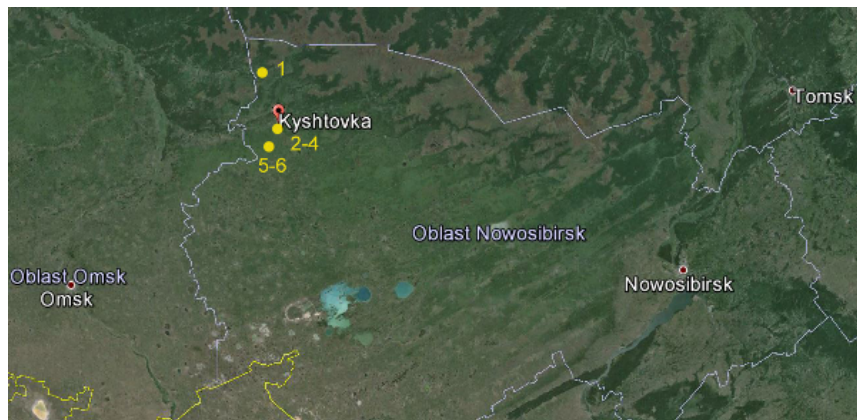
### **Introduction**

My involvement in assessing the butterfly fauna of Novosibirsk Province revealed that the north-western part of the province was, lepidopterologically speaking, a data blank spot. This may be explained by the fact that the area appears unpromising for butterfly diversity. The largest area of the province west of the Ob River consists of nearly a perfect plain with regular latitudinal zonation. The northwestern part is generally situated in the subtaiga (contiguous birch and aspen forest) and southern taiga zones, which are, when flat, characteristically poor in butterfly diversity. This area is also boggy, with the northern border of Novosibirsk Province meeting the notorious Vasyugan Bog. Although poor in butterflies, such area is good for dragonflies (Bernard & Kosterin 2010; Popova & Haritonov 2013).

Between 14-17 July 2015 I made a four-day trip to the northwestern Kyshtovka District, ostensibly to record butterfly species. While there I also paid attention on the dragonflies and damselflies. The majority of them were what might be expected from this area. However, two surprisingly northern records were made: *Coenagrion ecornutum* (Selys, 1872) and *Lestes macrostigma* Eversmann, 1836 (see 'Discussion').

## The area

Kyshtovka District resides on the flat West Siberian Plain in the following coordinate limits: 56°12'- 57°14' N and 75°50'-78°28' E, extending 114 km from north to south, and for 163 km from west to east (Fig. 1).



**Figure 1: Geographic position of the study area (Google Earth). The numerals denote localities explained in the text.**

Two slow, winding rivers with brown water drain the area: the Uy (Fig. 2a) and Tara Rivers (Fig. 2b), both tributaries of the Irtysh River. Kyshtovka village, at the centre of the district, resides on both banks of Tara which acts as the conventional border between the subtaiga zone (to the south) and southern taiga zone (to the north). The interfluvies are occupied by three huge bogs: Paganay Bog between Tara and Tartas (the next river to the south beyond the district, a tributary of the Om' River, which flows to the Irtysh) (~170 x 30 km), Gungzskoe Bog between Tara and Uy (~42 x 14 km), and the tremendous Vasyugan Bog (~470 x 160 km) to the north of Uy. The bogs recede from the rivers draining the terrain.

Curiously, neither bogs nor taiga are easily seen from the roads, which pass mostly through dry land and generally avoid both boggy depressions and very low ridges with taiga. Visible from the roads are either seemingly infinite birch forests interspersed with aspen and willows, or vast tall herbage meadows overgrown with birch saplings, which were formerly arable land. Paganay Bog appears from the road as three vast open areas covered with grass and reed (Fig. 3). One small round pine forest appeared in fact a raised peat-moss bog (locally called ryam) (Fig. 5). Extensive reed bed swamps with very shallow water and the ryam were the only wetlands available for study in that bog. Gunguzskoe Bog appears from the road as an open meadow area among birch forest and also one ryam.

A ribbon of taiga occupies a very low ridge north of Kyshtovka village, the Tara River and Lake Kyshtovo. The taiga is composed of a curious mixture of trees: common



**Figure 2.** The rivers of Kyshtovka District of Novosibirsk Province: a – the Uy River at Orlovka village (Loc. 1), 16.07.2015; b – the Tara River at Kyshtovka village (Loc. 4), 14.07.2015.

pine (*Pinus sylvestris* L.) with admixture of Siberian larch (*Larix sibirica* Ledeb.) in the upper layer; and Siberian spruce (*Picea obovata* Ledeb.) with admixture of Siberian





Figure 3. A reed swamp margined by a damp sedge meadow (Loc. 5) at the major Paganay Bog near Usmanka village, a habitat of *Lestes dryas*, *L. barbarus*, *Coenagrion puella*, *Aeshna serrata*, *Symptetrum flaveolum*, 15.07.2015.



Figure 4. The western water margin of the large Lake Kyshtovo (Loc. 2) at Kyshtovka village, a habitat of *Lestes dryas*, *Sympecma paedisca*, *Enallagma cyathigerum risi*, *Aeshna grandis*, *Libellula quadrimaculata*, *Symptetrum flaveolum*, *S. danae*, 14.07.2015.



**Figure 5. A round raised peat-moss bog (local ryam) (Loc. 6) inside the Paganay Bog at Usmanka village, a foraging habitat of *Lestes dryas*, *L. virens*, *L. barbarus*, *Sympetrum flaveolum*, *S. vulgatum*. 15.07.2015.**



stone pine (*Pinus sibirica* Du Tour) in the lower layer. The canopy creates dark conditions allowing few herbs. Characteristically, *Rubus saxatilis* L. and several species of ground orchids occur. Between the lake and taiga there is a strange transitory community of boggy pine forest, with the four layers represented, from top to bottom, by common pine, reed (*Phragmites australis* (Cav.) Trin. ex Steud.), scoring rush (*Equisetum fluviatile* L.) and bogbean (*Menyanthes trifoliata* L.). However, from the road crossing this ridge the taiga is scarcely seen behind the thick roadside birch and willow thickets, above crowns of which only some tallest pines and spruces can be noticed.

The second patch of taiga I visited occurs at the Uy River at Orlovka village. It was represented by larch forest (*Larix sibirica*, Fig. 2a) and an open stand of big larches and birches growing in large meadowy glades.

Lake Kyshtovo, formed by an ancient Tara oxbow, is rimmed by a broad floating bog; while the open water at abanks was surprisingly full of the water soldier (*Stratiotes aloides* L.) (Fig. 4). All roads in the area are feature high embankments accompanied by elongate roadside pools which proved good habitat for Odonata.

### Localities examined

Locality 1. The Uy River valley in the environs of Orlovka village (the northwesternmost one in Novosibirsk Province) (Fig. 2a). A slow brown river, with some *Nuphar lutea* (L.) Smith.; flowing in a broad valley clad with meadows, larch forest or larch-birch parkland. There are some small Uy oxbows and a small left tributary brook with thickets of submerged and emerging *Sparganium* sp. 56°56'27-55" N, 76°19'46"-20'29" E, 103-112 m a.s.l. 16.07.2015.

Locality 2. The western bank of Lake Kyshtovo 3.3 km NE of Kyshtovka village: a large lake (710 x 500 m) with a broad zone of *Stratiotes aloides* in water near the banks, some *Typha angustifolia* L. and *Thelypteris palustris* Schott at the margin edge (Fig. 4), a broad floating bog formed by sedge (*Carex* sp.) with *Eriophorum* sp., *Equisetum fluviatile*, *Comarum palustre* L., *Menyanthes trifoliata*, *Peucedanum palustre* (L.) Moench.. The lake is surrounded by birch groves with meadowy glades, willow thickets, a broad road and a stripe of taiga on a slight ridge north of the lake (see above). The invasive fish Chinese sleeper (*Percottus glenii* Dybowski, 1837) is said to be abundant. 56°35'03-21" N, 76°36'13-31" E, 89 m a.s.l. 14.07.2015.

Locality 3. Roadside pools 2 km NW of the centre of Kyshtovka village. 14-16.07.2015. On 16.07.2015 the following pools were examined separately and in detail.

Locality 3a. A long (not less than 100 m) swamp in a roadside ditch, with waist-deep open water with *Potamogeton alpinus* Balb.; the banks with *Carex rostrata* Stokes, *Equisetum fluviatile* and some *Eleocharis* sp., *Alisma plantago-aquatica* L., *Lythrum* sp. (Fig. 6). 56°34'40-51" N, 76°36'10-14" E. 81 m a.s.l.

Locality. 3b. 300-400 m from Loc. 3b. A 15 m long shallow swamplet in a roadside ditch, with *Carex* sp., *Eleocharis* sp. and some *E. fluviatile* (Fig. 7) and signs of cattle





Figure 6. A long roadside swamp at the Kyshtovka village northern margin (Loc. 3a), a habitat of *Lestes dryas*, *L. sponsa*, *L. virens*, *L. macrostigma* (?stray), *Coenagrion ecornutum*, *C. puella*, *Aeshna juncea*, *Libellula quadrimaculata*, *Sympetrum flaveolum*, *S. sanguineum*, 16.07.2015.

Figure 7. A shallow roadside swamplet at the Kyshtovka village northern margin (Loc. 3b), a habitat of *Lestes dryas*, *L. sponsa*, *L. virens*, *L. macrostigma*, *Libellula quadrimaculata*, *Sympetrum flaveolum*, 16.07.2015.



trampling. Cattle completely trampled this fragile vegetation the next day. 56°34'34" N, 76°36'17" E. 93 m a.s.l.

Locality 3c. 600-700 m from Loc. 3a, ca 300 m from Loc. 3b. A flooded and garbage-strewn man-made hole (3x5 m) at a construction site, with *Juncus* sp., *Eleocharis* sp., *A. plantago-aquatica* and *Butomus umbellatus* L. (Fig. 8). 56°34'36" N, 76°36'04" E. 95 m a.s.l.



**Figure 8. A small water-filled hole at the Kyshtovka village northern margin (Loc. 3c), a habitat of *Lestes dryas* and *L. macrostigma*, 16.07.2015.**

Locality 4. The Tara River valley within Kyshtovka village: a slow brown river rimmed with thick willow thickets (Fig. 2a), a meadowy floodplain, mostly overgrazed by cattle, with some birch and poplar groves (*Populus nigra* L.) and a system of oxbows of different sizes, depth and water vegetation (sedges, water soldier, *Nuphar lutea*) (Fig. 9). 56°31'38"-33'45" N, 76°33'51"-37'10" E, 81-93 m a.s.l. 14, 17.07.2015.

Locality 5. Margins of the major Paganay Bog 2.5-3 km E of Usmanka village, shallow reed swamps surrounded by damp meadows (Fig. 2) formed by fine non-tussock sedges (*Carex* sp.) with a yellowish-green aspect, many *Cirsium esculentum* (Siev.) C.A. Mey and sparse flowering *Primula longiscapa* Ledeb. and *Parnassia palustris* L., more elevated margins are occupied by birch groves alternating with rich flowery herbaceous meadows. 56°17'22-51" N, 76°31'07-55" E, 114-119 m a.s.l. 15.07.2015.





Figure 9. The Tara River right bank oxbows at Kyshtovka village (Loc. 4), habitats of *L. sponsa*, *Aeshna grandis*, *Somatochlora metallica*, ?*S. flavomaculata*, *Libellula quadrimaculata*, *Symptetrum flaveolum*, *S. vulgatum*, 14.07.2015.

Locality 6. A round raised peat-moss bog (ryam) 450 x 400 m within the same Paganay Bog 3.7 km NE of Usmanka village (Fig. 4), with a stand of tall pines at the periphery and small pines and birch sapling in the convex centre; a contiguous carpet of *Ledum palustre* L. and *Chamaedaphne caliculata* (L.) Moench with *Vaccinium uliginosum* L. and *Rubus chamaemorus* L.; margined with a narrow and distinct strip of dense birch stand with willows and reed in understory and abundant *Petasites frigidus* (L.) Cass. on the ground; surrounded by broad, rather dry sedge-reed meadows. No doubt, a remnant bog, with pines having started to flourish with improvement of edaphic conditions (?drainage). 56°19'01-17" N, 76°31'05-30" E, 115-116 m a.s.l. 15.07.2015.

## Results

### Odonata species recorded

*Calopteryx splendens* (Harris, 1782)

Loc. 1: 1 ♂ seen.

*Lestes barbarus* (Fabricius, 1798)

Loc. 5: 1 ♂ collected. Loc. 6: 1 ♂ collected.

*Lestes dryas* Kirby, 1890

Loc. 2: several. Loc. 3a: very numerous. Loc. 3b: many. Loc. 3c: several. Loc. 5: common. Loc. 6: common.

*Lestes macrostigma* (Eversmann, 1836)

Loc. 3a: 1 ♂ collected. Loc. 3b: 2 ♂♂, 1 ♀ collected. Loc. 3c: 2 ♂♂ collected.

The small, shallow swamplet in a roadside ditch, ca 15 m long, trampled by cattle, with *Carex* sp., *Eleocharis* sp. and some *Equisetum* (Loc. 3b, Fig. 7), provided the largest number – three – of specimens of this species. They were found among equally abundant *L. dryas* and *L. sponsa* and some teneral *L. virens*. We should assume this swamplet as the best habitat for *L. macrostigma* in the area. Two males were collected ca 300 m apart, at a man-made hole, with *Eleocharis* sp., *Alisma plantago-aquatica* and *Butomus umbellatus* (Loc. 3c, Fig. 8), with several males of *L. dryas*. A male of *L. macrostigma* was also observed in herbage under the canopy of a nearby birch grove. The long and quite deep roadside swamp of Loc. 3a (Fig. 6) seemed to scarcely fit *L. macrostigma* habitat, since an hour of thorough searching produced only one male (numerous *L. dryas* and many *L. sponsa* and teneral *L. virens* were seen). It is possible that this male had migrated there for 400 m from Loc. 3b.

*Lestes sponsa* (Hansemann, 1823)

Loc. 3a: many (inferior in number to the above sp.). Loc. 3b: many (equal shares with the above sp.). Loc. 4: numerous

*Lestes virens* Charpentier, 1825

Loc. 3a: numerous teneral ind., 1 ♂ collected. Loc. 3b: many teneral ind. Loc. 6: 1 ♀ photographed (Fig. 10), several ind. seen. *Sympecma paedisca* (Brauer, 1877)  
Loc. 2: 1 ♂ (on the floating bog) released. Loc. 3b: 1 ind seen. Loc. 6: 1 ind. seen.



**Figure 10. A female of *Lestes virens* at the raised peat-moss bog with pine (Loc. 6) 3.7 km NE Usmanka village, 15.07.2015.**

*Coenagrion puella* (Linnaeus, 1758)

Loc. 3a: several ♂♂ seen, 1 ♂ collected. Loc. 5: 1 ♂ collected.

*Coenagrion ecornutum* (Selys, 1872)

Loc. 3a: 1 ♂ collected, 1 more seen.

*Enallagma cyathigerum risi* Schmidt, 1961

Loc. 2: 1 ♂, 1 ♀ collected.

*Aeshna juncea* (Linnaeus, 1758)

Loc. 3a: 2 teneral, just hatched ♀♀ checked and released.

*Aeshna serrata* (Hagen, 1856)

Loc. 3: several ♂♂ seen, 1 checked and released. Loc. 5: 1 ♂ checked and released, several more seen.

Some large blue males of *Aeshna* were also seen along the road to Orlovka but were not caught and checked.

*Aeshna grandis* (Linnaeus, 1758)

Loc. 1: several seen. Loc. 2: several seen. Loc. 3: common. Loc. 4: several seen.

?*Aeshna viridis* Eversmann, 1836

?Loc. 6: several ♀♀ seen.

Several clear green *Aeshna* were startled from the *Ledum* shrubbery, none of them collected. The coloration suggested females of *A. viridis* as the most probable option, but females of *A. serrata* or *A. crenata* could not be excluded.

*Somatochlora flavomaculata* (Vander Linden, 1825)

?Loc. 1: several ind. seen above the road. Loc. 2: common above the road.

?Loc. 4: several seen.

These dragonflies were almost permanently seen at daytime to fly slowly several metres above forest roads and the Tara River floodplain (Loc. 4). They exhibited a variable degree of wing darkening - from slight to strong - which is characteristic for this species in West Siberia (Bernard & Kosterin 2010). At Loc. 2 some individuals were checked in hand; at Locs. 1 and 4 they were not, but behaviour and wing darkening suggested this species.

*Somatochlora metallica* (van der Linden, 1825)

Loc. 1: several ♂♂ seen (above the Uy water). Loc. 4: 1 ♂ released.

Males slowly ranged just above water along bank vegetation, at a Tara large oxbow and at the Uy River.

*Libellula quadrimaculata* Linnaeus, 1758

Loc. 1: several seen. Loc. 2: common. Loc 3: common. Loc. 4: common

*Sympetrum flaveolum* Linnaeus, 1758)

Loc. 1: very numerous (Fig. 10). Loc. 2: numerous. Loc. 3a: several. Loc. 3b: very numerous (mostly teneral). Loc. 4: extremely numerous; Loc. 5: numerous at herbaceous meadows, few at damp meadows and reeds. Loc. 6: few.

Very numerous (Fig. 11) everywhere at meadows and other open terrain and at roadside pools, where many tenerals were observed, but quite scarce at any sedge or reed bogs.

*Sympetrum danae* (Sulzer, 1776)

Loc. 2: 1 teneral ♂ released.

*Sympetrum sanguineum* (Müller, 1764)

Loc. 3a: several ♂♂ seen, 1 ♂ collected.



*Sympetrum vulgatum vulgatum* (Linnaeus, 1758)

Loc. 4: common, 1♂ collected. Loc. 6: numerous.

An abundance of these dragonflies at a waterless peat-moss bog was quite surprising. They perhaps migrated there for feeding from the surrounding shallow reed swamps, where this species would find its preferred breeding habitat, but where I failed to observe any individual.



**Figure 11. *Sympetrum flaveolum* perching at a railing of a bridge across the Uy River in Orlovka village (Loc. 1), 16.07.2015.**

## Discussion

### Species recorded

In total, 21 odonate species were found over the four days. Only two species of *Coenagrion* were seen but it was rather late in the season for this genus (and probably also for *Leucorrhinia*). It was, however, good for *Aeshna* spp., of which I was surprised not to find *A. crenata* (Hagen, 1856), for which this woody terrain looked quite favourable. I checked a few blue males ranging over the roadsides and between the birch groves and they proved to be *A. serrata*; the rest were also coloured rather more like *A. serrata*

(as having clear yellowish synthorax stripes) than *A. crenata*. A large water area of Lake Kyshtovo filled with water soldier (Fig. 5) caused me to expect a great abundance of *A. viridis* to commence their feeding flight at dusk everywhere in a broad surroundings of this presumed breeding place (e.g. in the streets of Kyshtovka), as I used to observe in northern Omsk Province (Kosterin 2008) and at Novosibirsk (Kosterin 2007). Surprisingly, no *Aeshna* were observed flying in dusk. Instead, females, probably of *A. viridis*, were observed in a raised peat-moss bog with pine (Fig. 4), possibly having arrived there from some of the roadside swamps. Absent among the species recorded was *Aeshna subarctica* (Walker, 1908), which is confined to peat-moss habitats (Bernard & Kosterin 2010). This could be explained by the fact that no such habitats with any water present were visited. (The only peat-moss observed, Loc. 6, was pretty dry and raised). No gomphids were found, perhaps because too little time was spent at the rivers.

The record of *L. macrostigma* is most probably the northernmost in the Palaearctic realm. The only more northerly report, at 56°50' N, is a dot at Sverdlovsk (presently Ekaterinburg) on the distributional map for this species in Belyshev (1973). However, in the text we read: "The northern border of its range in the east strongly descends to the south: Lake Uvil'dy in Cisuralia – Omsk city – the Anuy River lower reaches at the sub-Altaian plains" (Belyshev 1973: 498). That is, in the text Belyshev traced the species northern border in Ural from Lake Uvil'dy, which is situated nearly at the same meridian as Ekaterinburg but for more than a degree southerly, at 55°31' N. There is not any mention of this record in the Russian odonatological literature. The dot at Ekaterinburg may hence be just a mapping error. Note that Yanybaeva et al. (2006) in their paper on South Ural, based mostly on the authors' own data, did not mention *L. macrostigma* for Ekaterinburg, although they did report other species from this locality. In the Skvortsov (2010), Sverdlovsk Province is hatchworked for *L. macrostigma* as when "the local faunistic data are doubtful or very much out of date". The northernmost record of *L. macrostigma* in both Yanybaeva et al. (2006) and Haritonov & Eremina (2010) is at 55°33' N (Lake Alabuga). Note that both papers are devoted to South Ural while Ekaterinburg is traditionally attributed to Middle Ural. Nevertheless, localities considered (for all species) in Yanybaeva et al. (2006) reach just as northerly as Ekaterinburg while those considered by Haritonov & Eremina (2010) reach only 55°43' N.

The record of *C. ecomutum* is presently the northernmost in west Siberia and Ural (Popova & Haritonov 2012), although in East Siberia it was recorded as northerly as 62°06' N at Magan near Yakutsk (Fukui 1992). So far there were only three recent records (since 2008) of this species in the centre (one locality) and east (two localities) of Novosibirsk Province (Yanybaeva et al. 2006; Haritonov & Eremina 2010; Popova & Haritonov 2012). Most probably it is presently expanding its range (Popova & Haritonov 2012; Kosterin 2015).

It is noteworthy that of the two possible subspecies of *E. cyathigerum* (Charpentier, 1840), the nominotypical and *E. c. risi*, I found at Kyshtovka the latter. It ranges from SE Europe through Siberia to Transbaikalia and in Central Asia. This is, however, not the northernmost record of this taxon, since both subspecies were found in Tomsk Province at the northeastern margin of the Vasyugan Bog (note Kyshtovka is situated to



the south of this bog). There *E. c. cyathigerum* occurred at small water 'windows' amidst vast peat-moss bogs, while *E. c. risi* was found in abundance at a large pond in the town of Bakchar, indicating at some habitat segregation in sympatry - which could be an argument in favour of their being bona species. It was this point of view that was accepted in the cited paper (Bernard & Kosterin 2010), as its first author insisted. I am, however, convinced of their subspecific status because transitory populations occur in Ural, Altai, Tuva and the Russian Far East (Kosterin 2004; Kosterin & Zaika 2010). Occurrence of *E. c. risi* at the very large Lake Kyshtovo is in line with the above-mentioned observations in Tomsk Province. The forest-steppe and steppe plains of Siberia are inhabited solely by *E. c. risi*, where it breeds in mass quantities at open lakes, especially brackish ones. The taigous northern or elevated (such as Todzha Depression) areas are occupied by *E. c. cyathigerum*; with transitory populations existing in the woody mountains at the latitudes where *E. c. risi* occurs in plains (Kosterin 2004; Dumont et al. 2005; Kosterin & Zaika 2010).

### ***Lestes macrostigma* habitat**

There is some discrepancy between the European and Siberian data on the habitats of this species. According to Belyshev (1973: 499-500), "In the larval phase inhabits very diverse stagnant water bodies: lakes and bogs, but mostly prefers small ones with rush thickets [O.K.: Belyshev used the Russian word 'kamysh' which is an official name of *Scirpus* but colloquially is much more often applied to *Typha*; it is unclear what Belyshev meant, perhaps *Scirpus* or even *Bolboschoenus* (Russ. 'klubnekamysh') which would fit *L. macrostigma* best, see Lambret et al. (2015a, b)] thickets. The species was found also on large lakes, but only at places with rush. Tolerates polluted and mineralised water. Apparently does not avoid temporary waters, at which it is present en masse during absence of water. This damselfly is indifferent to the ground vegetation and quite tolerates its absence at steppe lakes [It is clear that here Belyshev obviously implied arboreal vegetation, but his wording is strange in Russian also]. Absolutely does not ascend to the mountains."

During my observations in the city of Omsk in 1970-1990s, I found this species in seven of the nine water bodies examined and came to the same conclusion: "... *L. macrostigma* ... [eight more species listed here] seem to have no preference of any type of stagnant water. ... It should be noted that *L. macrostigma* and *S. paedisca* are the only species inhabiting a reed swamp situated in the vicinity of the Om' right bank in eastern suburbs. This swamp has considerably salinized water that is evidenced by the thickets of *Salicornia europaea* L. (Larvae of *L. macrostigma* were found there in a small pool crossed by a tiny effluent stream)." (Kosterin 1996: 17). On short visits to Omsk in 2000-s I did not specially search for this species and did not observed it again on those water bodies, but on 30.06.2008 I found about a dozen individuals in young reed along the bank of a newly examined Lake Solenoe [Russ. 'Salty'] in the southernmost part of the city (54°53'06-13" N 73°20'48-59"), which has a strongly mineralised water, green because of algae, banks of a smelly black mud (used by local people for curing procedures), and riparian vegetation represented by an inner strip of reed and an outer strip of *Bolboschoenus maritimus* (L.) Palla and *Triglochin maritimum* L. In Central Tuva, a single male of *L. macrostigma* was observed at the bank of a very salty Lake Khady, and in northern

Mongolia also a singular male was registered at the huge brackish Lake Ubsu-Nur southern bank (Kosterin & Zaika 2010).

On the other hand there are West Siberian records of this species at lakes and ponds with obviously fresh, changeable water: in 1981 with low abundance at Lake Manzherok in northern Altai Mts. (423 m a.s.l.), with the influx and outlet brooks (Kosterin 1987); in 2001 at a pond on the Zyryanka Rivulet in Novosibirsk Academy Town (the only male for some 30 years of repeated examination) (Kosterin 2007). Note that there were no brackish habitats for hundreds of kilometres from both sites.

Kyshtovka District is generally very boggy, with the bogs accumulating non-mineralised (but acidous) water. Besides, the Kyshtovka village environs are well drained by the Tara River. That means that the roadside pools inhabited by *L. macrostigma* were by no means brackish but surely fresh.

At the same time in Western Europe, this species "is almost always encountered at brackish waters, either continental or coastal" (Boudot et al. 2009: 32). Lambret et al. (2015a) claim more straight-forwardly that this species "is restricted to brackish waters". It would be interesting to check for existence of some genetic specificity of populations inhabiting fresh and brackish water in Siberia.

In Europe, Lambret et al (2015a, b) revealed a strong association of *L. macrostigma* with presence of *Bolboschoenus maritimus*, the shoots of which serve a cue for the choice of oviposition sites, while its dead shoots are preferred for actual oviposition, although there are populations at habitats without *B. maritimus*. Dead (but not living) shoots of *Juncus maritimus* Lam. appeared another useful substrate for oviposition (Lambret et al., 2015a). It is noteworthy that the habitats of *L. macrostigma* at Kyshtovka (Locs. 3b and 3) missed *Bolboschoenus maritimus*. There was *Juncus* sp. at the water edge of the hole of Loc. 3c (Fig. 8), but none was noticed at Loc. 3b (Fig. 7) where more individuals of *L. macrostigma* were found. It may be supposed that not only ecological but even behavioural preferences in *L. macrostigma* may somewhat differ in Siberia and Western Europe, being broader and less focused in the former. This could result from a greater genetic diversity of this species in Siberia than in Europe, also with respect of unknown genes responsible for those preferences (allowing e.g. the northwards penetration into the Boreal zone), while West European populations could represent an ecologically specialised western lineage (confined to the Mediterranean). No doubt, detailed ecological and genetical studies of *L. macrostigma* in Siberia are welcome. As a first step, the Kyshtovka specimens have been sent to Philippe Lambret for his molecular phylogeographic analysis.

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